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ON THE CAUSE OF DETERIORATION IN SOME OF OUR NATIVE GRAPE-VINES, AND ONE OF THE PROBABLE REASONS WHY EUROPEAN VINES HAVE SO GENERALLY FAILED WITH US.

BY C. V. RILEY.*

THE GRAPE-LEAF GALL-LOUSE (*Phylloxera vitifoliæ*† Fitch.).—The experience of the past year, enables me to add much of interest and importance to last year's account of the above insect. This experience has already been made public in an article published in the "Rural New Yorker," and reproduced in the "Rural World" of St. Louis. I am pleased to know that the views there set forth receive the indorsement of such an experienced and practical man as Mr. Geo. Husmann, the well known grape authority in our State, and editor of the vineyard department of the last named journal.

It is well known that nearly all the varieties of the European grape-vine (*Vitis vinifera*) have, in the end, proved valueless when introduced and cultivated in the eastern half of the United States. The majority of them grow well at first, and a few exceptional cases might be mentioned where some of them, such as the Black Hamburg and Chasselas, have even fruited successfully for many years, especially when isolated or trained against walls; while they more generally do well when isolated in cold houses. But the general truth of the first statement holds good. It is also well known that some of our native vines, which for a while were universal favorites on account of their productiveness, vigor and other excellent qualities, have of late years sadly deteriorated. Among such the Catawba was for a long time the popular grape; but its cultivation is now entirely abandoned in many parts of the Mississippi Valley, and even at Hammondsport and other parts of New York, and Nauvoo, Illinois, where it is still largely cultivated, I learn from experienced grape-growers that it is fast on the decline.

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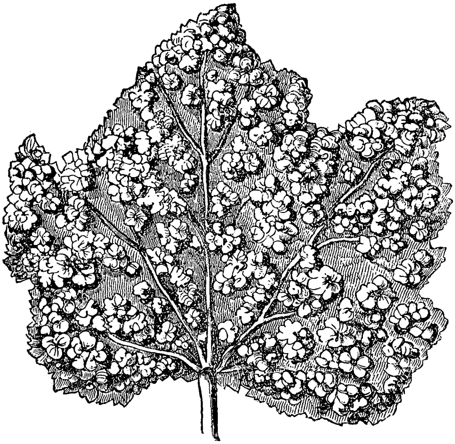
* We copy this from Mr. Riley's 4th Report as Entomologist to the State of Missouri, 1872, and have to thank Mr. Riley for the use of the cuts.—EDS.

† This is the specific name by which I last year gave an account of this grape-vine insect; and I employ it again for that very reason, and for the further reason that it is the name most familiar to the American reader. I have already given my opinion (3rd Rep. p. 95, note) that though the name is objectionable, it ought perhaps to be retained. It is doubtful, however, whether many other entomologists will agree with me; and while I believe in carrying out the "law of priority" to its fullest extent, consistent with reason, there are many cases where it must give way to that of "accord." The present is, perhaps, just such a case; for aside from the technical objection, Dr. Fitch knew so little of the insect's true characters, when he named it, that he cannot be said to have described it, and did not refer it to its proper genus which was already erected to receive it. His name will, therefore, doubtless give way to that of *Phylloxera vastatrix*, which Planchon first gave to the root-inhabiting form, and which has generally been recognized abroad. The same may be said of Westwood's name *Peritymbia vitisana*, which was also proposed for the same insect in 1868, in a communication to the Ashmolean Society of Oxford, England.

This deterioration — this failure, has been attributed to a variety of causes, for in the absence of anything definite and ascertainable to keep it within bounds, the speculative turn of our minds is sure to have full scope, and grasping at every shadow of probability, leaves no possible theory unsearched. As in all such cases, also, the mind gets lost in, and is satisfied to vaguely rest with, the theory least provable; and to some occult and mysterious change of climate we are at last satisfied to attribute the change though, if the meteorological records were carefully examined, they would probably show no difference in the mean annual condition of our climate during the past half century.

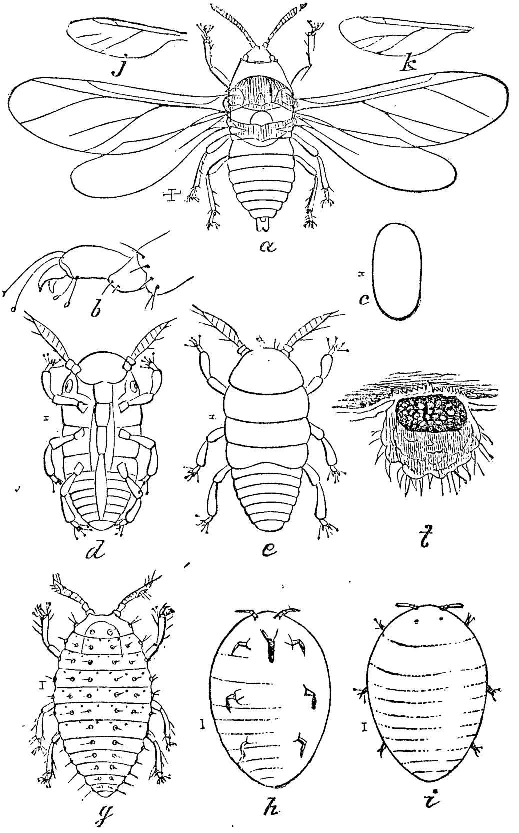
Fig. 127.



Leaf covered with galls.

It is very natural to suppose that vines of European origin should be less hardy in this country than our native varieties, that as in the case of the Spanish Chestnut, the English Gooseberry, etc., etc., there is something in our climate which precludes their flourishing as well here as there. I would by no means deny that such is the case, for it is this very comparative tenderness which predisposes them the more to the destructive agent of which I am about to speak. Yet when we consider that in some parts of Europe, where the Vine flourishes, the extremes of heat and cold are as great as here; that we possess a great variety o soil and climate, and that by covering and other modes of protection in winter, we may, where necessary, counteract the rigor of the latter — it would appear that we certainly have attributed too much to climatic influence: and such a view is strengthened by the fact that our native varieties, if free from the insect which forms the subject of this article, usually do well when cultivated in Europe, and further that the *Vitis vinifera* is not a native of Europe, but of western Asia.

Fig. 128.



Grape Gall-louse; *a*, winged female; *b*, her tarsus, *c*, egg, *d*, the newly hatched gall-inhabiting type, ventral view; *e*, dorsal view; *f*, section of a gall; *g*, the tubercled root-inhabiting form; *h*, the mother gall louse at the height of her fertility, ventral view; *i*, dorsal view; *j* and *k*, differently veined wings of the Oak *Phylloxera* from Europe. All these figures are greatly enlarged, the natural size being shown by the hair lines at the side of each.

The above reflections are of a general character, but apply more particularly to the great State of Missouri, which is admitted to be, in many parts, eminently adapted, both by soil and climate, to the cultivation of the Vine.

One of the reasons why the European vines do well in California, outside of and beyond the more favorable clime in that portion of the continent is, no doubt, because the insect which here affects them, like many other species common on this side of the Rocky

Mountains, has not yet crossed to the other side. If such is the case, our California neighbors should take warning from Europe, and guard, if possible, against an invasion.

The announcement that I have at last ascertained one of the principal causes, if not the sole cause, of this decline, and that, knowing the cause, we may in a measure obviate it, will doubtless cause many a grape-grower to wonder. Some may even pooh-pooh the idea, and deem it impossible that they have so long remained in ignorance of so important a fact, that a "bug-hunter" should discover it at last. Let the facts speak.*

This destructive agent is none other than the little insect we are now treating of.

The general history of the louse, and the habits of the gall-inhabiting type were sketched in my last Report, and need not be repeated.

FURTHER PROOF OF THE IDENTITY OF THE AMERICAN INSECT WITH THE EUROPEAN.—That the two are identical there can no longer be any shadow of a doubt. I have critically examined the living lice in the fields of France, and brought with me, from that country, both winged male and female specimens, preserved in acetic acid. I find that the insect has exactly the same habits here as there, and that winged specimens which I bred last fall from the roots of our vines, accord perfectly with those brought over with me. In the different forms the insects assume, in their work, and in all other minutia, the two agree.

WHY I CONSIDER THE GALL-LOUSE AND ROOT-LOUSE IDENTICAL.—First, wherever this insect has been noticed in England, both the gall-inhabiting and root-inhabiting types have been found. In France, the galls occur abundantly on such of our American

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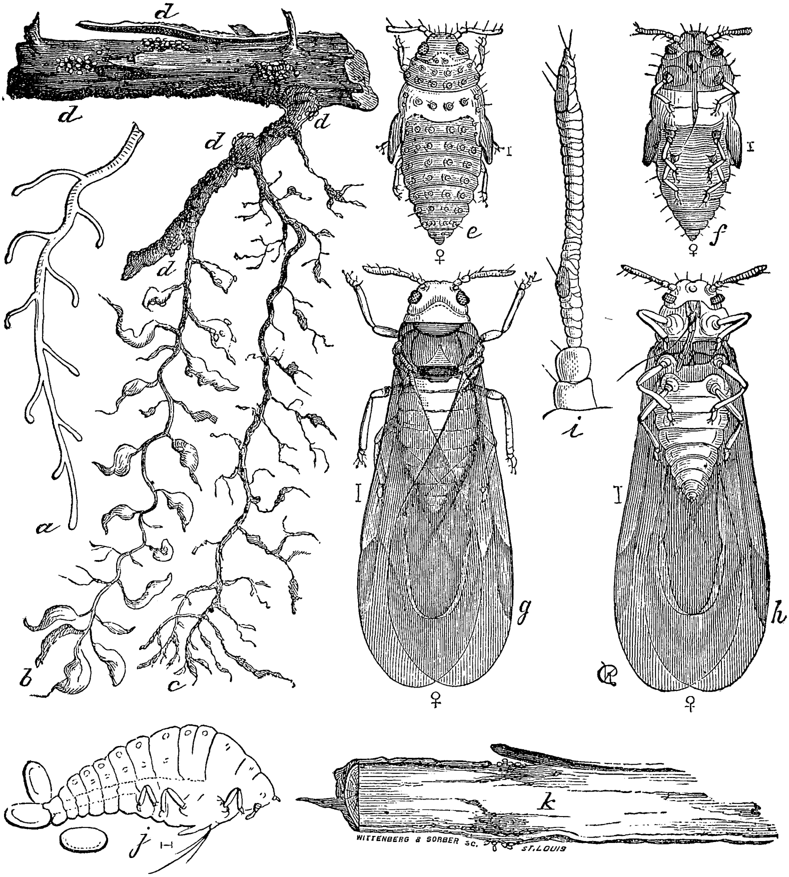
*It is really amusing to witness how the facts here set forth have been received by hose who never spent ten minutes' investigation of the subject in their lives. In the silk-worm disease that has of late years been so prevalent in Europe, M. Pasteur, after the most painstaking and elaborate experiments, at which he sacrificed his health, unravelled its mysteries, gave to the world the true pathology of *pebrine*, and what is more, showed how it might be eradicated. Yet, as I shall show further on, the men most interested were very slow to believe the hard, dry facts which had been snatched from the unknown, and, never having studied the case themselves, were more inclined to consider the disease as something mysterious—something altogether beyond man's understanding, and consequently uncontrollable. The most ignorant are always the most skeptical! I might mention several parties who have expressed their opinion that the *Phylloxera* has no connection with disease or decline in the Vine. To such, I simply say: examine for yourselves, before giving an opinion. Others whom I might mention go to the other extreme and assert that it must be the cause of mildew, oidium, etc., and without any good reason put a similar opinion in my mouth. To these last, I say: read aright, do not misconstrue, and by no means jump to conclusions!

varieties as are subject to them here; while a few have occasionally been found on their own varieties. Secondly, I have successfully transferred the leaf-lice on to the roots, while M. V. Signoret has succeeded in obtaining leaf-galls from lice hatched on the roots. Thirdly, the winged form obtained by Dr. Shimer from the galls in this country agrees in its characters with those from the roots. Fourthly, the nodosities on the roots are, as already stated, perfectly analogous to the galls on the leaves, and differ only in just such a manner as one would expect from the difference in the plant tissues — a view greatly strengthened by the fact that when the gall-lice are forced, by their excessive numbers, to settle on the tendrils or leaf-stalks, they produce swellings and knots approaching more nearly to those on the roots than to the galls. These facts sufficiently attest the identity of the two types, and we have here another case of an insect possessing two distinct habits. It is also like many others of its family, polymorphic, *i. e.*, it exists in different forms; yet we have to do with but one species.

FURTHER FACTS RESPECTING THE HABITS OF THE ROOT-INHABITING TYPE. — The young hatched from the eggs on the roots are absolutely undistinguishable from those hatched in the galls; and the gravid apterous female differs in no respect whatever from the mother gall-louse. There is, however, a different egg-depositing form, which, as it moults, becomes tubercled, and more elongated or pear-shaped, as shown at Figure 129, *j*. Some of these tubercled individuals remain without wings, while others seem to be destined from the first to acquire wings. The young, after attaching themselves, become in a measure stationary, and remind one very much of young bark-lice. The fine hair-like setæ, which in their functions and elasticity are analogous to our tongue, become loosened from the more fleshy rostrum or sheath, as shown at Figure 129, *j*, and are often so firmly inserted into the root that the louse, if disturbed from its place, generally hangs by them. Three of the threads of this tongue are sufficiently conspicuous, but there should be from analogy, four. The females on the roots seem to be less prolific than those in the galls, and their eggs if anything are rather larger. These eggs are always of a bright yellow color, and, on the dark root, are detected with the naked eye as readily as the lice, which become darker or of a dull orange as they grow older.

The insect is found on the roots in all stages during the summer months. In the winter it is found dormant, principally in the larva state, and no eggs are to be seen. With the circulation of the sap in spring, the activity of these young recommences, and in a short time afterwards eggs are deposited again. At this season the punctures of their little beaks produce very decided swellings and an excess of moisture at the wounded parts. The winged forms are by no means uncommon and commence to issue

Fig. 129.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WITTENBERG & SORBER Sc. ST. LOUIS

a, shows a healthy root; *b*, one on which the lice are working, representing the knots and swellings caused by their punctures; *c*, a root that has been deserted by them, and where the rootlets have commenced to decay: *d*, *d*, *d*, shows how the lice are found on the larger roots; *e*, female pupa, dorsal view; *f*, same, ventral view; *g*, winged female, dorsal view; *h*, same, ventral view; *i*, magnified antenna of winged insect; *j*, side view of the wingless female, laying eggs on roots; *k*, shows how the punctures of the lice cause the larger roots to rot.

from the ground perhaps as early as July. When I last examined the roots before my departure, or about the middle of May, no pupæ were found; but winged insects were obtained as early as July in France, and after my return I had no difficulty in obtaining all I wished, especially during the latter part of September. The pupæ are easily recognizable with a good lens, by the little dark pad-like wing-sheaths at the sides of the body (Fig. 129, *e*, *f*)—and the sexes may even be distinguished at this stage by the greater constriction of the body near these pads in the female, compared to the male, her abdomen being larger. Before giving forth the winged insect, these pupæ become quite restless and active, and in a state of nature they no doubt issue from the ground.

The winged female (Fig. 129, *g*, *h*) seems to be much more common than the male, and is distinguished by her more lengthened abdomen — the wings, when closed, extending not much more than its length beyond the tip, while in the male they extend more nearly three times its length. The dusky thoracic band is not so distinct and the abdomen is more produced at the apex in the male; and there is also a slight difference in the venation of the wings of the two sexes, which venation is best seen in the fresh specimens, as it becomes in a measure obsolete in drying. In the abdomen of the female two or three large eggs are plainly visible, especially after being soaked in acetic acid. The two-jointed tarsus or foot is also plainly visible in such specimens, and I have found the joint movable, while M. V. Signoret, of Paris, has obtained the skin of the tibia or shank with the basal joint of the tarsus hanging to it. Prof. Westwood also refers to a short basal tarsal joint in the gall insect which he described. These facts, trivial as they may appear, are very important in a scientific view, as they forever settle the differences that have existed as to the proper systematic position which the louse occupies.

SUSCEPTIBILITY OF DIFFERENT VINES TO THE ATTACKS OF THE LOUSE.—I have carefully examined a great many different kinds of vines within a circuit of thirty miles of St. Louis, as well as in Cole, Jefferson and Boone counties, in this State, and the summary which follows indicates the susceptibility of the different varieties to this disease. There may be objection on the part of some persons to the placing of some of the varieties in the following tables and the opinions both of botanists and vine-growers are so at variance that I shall give in the subsidiary note* my reasons for so placing them. I am familiar with the views of many of the leading grape-growers of the country, and have had an opportunity of studying the genus by the excellent herbarium

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*CLASSIFICATION OF THE N. A. GRAPE-VINES.—In few genera of plants is it more necessary to accumulate abundant material in order to arrive at correct classification than in the genus *Vitis*. The species are with difficulty defined, as they vary in a marked manner in different sections of the country; and the foliage of the same individual vine often varies greatly at different ages and seasons. Preserved leaves are not alone to be trusted therefore, but every stage of growth must be considered, from the wood to the different leaves, the blossom, bunch, berry and even the seed, which in its shape, and especially in the development of its raphe (or cord) furnishes, according to Dr. Engelmann, some of the most permanent distinguishing traits between the species.

It is interesting to know that not a single real species has been added to those belonging to the old territory of the United States, east of the Mississippi river, since the time of Linnæus and Michaux; though Rafinesque, LeConte, and perhaps others, have attempted to distinguish a great many more.

The number of Grape-vines bearing edible fruit,* now considered species by the best botanists in the territory of the United States, is limited to 9. They may be tabulated as follows:

I. VINES WHICH ARE OF PRACTICAL CONSEQUENCE, AS HAVING YIELDED OUR DIFFERENT CULTIVATED VARIETIES.

1. *Vitis Labrusca* Linn. Northern Fox.
2. “ *Æstivalis* Michx. Summer Grape.
3. “ *Riparia* Michx. River Bank Grape.
4. “ *Vulpina* Linn. Southern Fox, or Muscadine.

II. VINES OF LESS CONSEQUENCE, AND WHICH HAVE THUS FAR GIVEN NO CULTIVATED VARIETIES.

5. “ *Vitis Cordifolia* Michx. Winter or Frost Grape.
6. “ *Californica* Benth. Confined to California.
7. “ *Arizonica* Engelm. Similar to the last.
8. “ *Candicans* Engelm. Mustang Grape of Texas.
9. “ *Rupestris* Scheele. Bush Grape or Sand Grape.

Of these 9 species only 4 grow wild in our own state, viz; *æstivalis*, *cordifolia*, *riparia*, and *rupestris*.

In stating last year (3rd. Rep. p. 90) that our cultivated varieties had been referred to four species, including *cordifolia* and omitting *riparia*, I followed the later editions, of Gray's Manual, in which the latter is considered as a variety of the former. The reasons for adopting a different course will be found in the following synopsis which has been kindly prepared for me by the author.

THE TRUE GRAPE-VINES OF THE OLD UNITED STATES.

BY DR. GEORGE ENGELMANN OF ST. LOUIS.

1. GRAPE-VINES WITH LOOSE BARK (AT LAST SEPARATING IN SHREDS), CLIMBING BY THE AID OF BRANCHED TENDRILS, OR (IN NO. 4) SCARCELY CLIMBING AT ALL.

a. Berries small, 3—6 *or rarely* 7 *lines in diameter; seeds obtuse, with the raphe (or cord) more or less prominent (except in No.* 4*) over the top. All the species of this group,*

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*There are a few species forming the sections (or, according to others, genera) *Cissus* and *Ampelopsis* which are now classed with *Vitis;* but they bear no edible fruit, and are otherwise easily distinguished from the true grape-vines.

of Dr. Engelmann. It is gratifying to know, therefore, that the position given to such cultivated varieties as obtain in this herbarium, agrees with that given to them by leading grape-growers — the views of the botanist and the practical man coinciding.

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just like the European grape-vine, exhibit on well grown shoots a regular alternation of two leaves each having a tendril (or its equivalent, an inflorescence), opposite to them, and a third leaf without such a tendril.

1. VITIS CORDIFOLIA *Michaux* — Usually tall, climbing high, trunks not rarely 6—9 inches in diameter. Leaves middle sized, heart-shaped, mostly entire or rarely slightly trilobed, with shallow broad teeth, usually smooth and shining on both sides, the young ones sometimes slightly downy below; berries among the smallest; in large bunches, black without a bloom, maturing late in the fall, usually with only one short and broad seed marked by a prominent raphe.

This is a common plant especially of the river-bottoms, and well known under the name of Winter grape, Frost grape or Chicken grape. It is found from New England to Texas, and westward to the western limits of the wooded part of the Mississippi valley. In this valley, at least, the fruit has a strongly- and even fetidly-aromatic taste. No cultivated varieties of the species are known.

2. VITIS RIPARIA *Michaux*—Mostly a smaller plant than the last, but with larger and more or less cut-lobed glabrous shining (or rarely when young, slightly downy) leaves, the lobes long and pointed; the teeth also more pointed than in *cordifolia*; berries as small, or usually larger than in the last, mostly with a bloom, in smaller bunches, mostly 1 or 2 seeded; seeds with a less prominent raphe.

This species prefers thickets or rocky soil on river banks and extends as far west and south as the last, and much farther north, being the only grape-vine in Lower Canada, where it is found even 60 miles north of Quebec. The northern form, in Canada, northern New York to Michigan and Nebraska, has fewer and larger berries in a bunch and is easily distinguished from *V. cordifolia.* The southwestern form, however, approaches more closely to this last species, with which Prof. Gray in the later editions of his Manual has united it. The fruit ripens earlier than that of *cordifolia,* and is much pleasanter. In St. Louis a variety found on the rocky river banks is brought to market in July. A number of cultivated varieties are referable to this species, among which the *Taylor Bullit*, the *Delaware* and the *Clinton,* are the most prominent.

3. VITIS ÆSTIVALIS *Michaux* — Smaller than the first, climbing over bushes and smaller trees, leaves large, of firmer texture than the preceding ones, entire, or often more or less deeply and obtusely 3-5 lobed, with short and shallow, broad teeth; when young always very woolly, mostly bright red or rusty; at last smoothish but dull and never shining like the preceding ones; berries usually larger than in both others and, when well grown, in compact bunches, coated with a distinct bloom; seeds usually 2 or 3 with a very prominent raphe.

This is the well known *Summer grape* common throughout the middle and southern States, usually found on uplands and in dry open woods or thickets, maturing its fruit in September. It is the most variable of our grape-vines and hence has seduced superficial observers into the establishment of numerous nominal species. A form with large leaves which retain their rusty down at full maturity has often been mistaken for *Labrusca,* which does not grow in our State. Another form, more bushy than climbing, with deeply lobed rusty-downy leaves and very sweet fruit, is *Vitis Lincecumii* of the sandy soil of Louisiana and Texas. This species assumes a peculiar form approaching *V. cordifolia* through its smaller black berries without bloom and in larger bunches, when it gets into shady woods with rich soil. Another form, with ashy-white, downy, scarcely lobed leaves, and fruit like the last mentioned, which grows in our bottoms, often climbing high trees, or growing over bushes on the banks of lakes, I have distinguished by the name of *cineria.* It is not always easy to distinguish such forms from the other species and perhaps less so to unite them under the

When we find it so difficult to properly separate the wild species, we can no longer wonder at the difference of opinion as to the nature of many of our cultivated varieties; for some of them have become so modified that they furnish scarcely any indication of their parentage. If those grape-growers who take interest in such matters will send specimens of such cultivated varieties as they wish to properly classify, to Dr. Engelmann, either directly or through me, they will at least get the opinion of one who is

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single species *æstivalis*, unless the essential characters above enumerated be closely attended to, and the numberless gradual transitions from one form into the other be watched.

We cultivate many varieties of this valuable species, the most important of which are the *Virginia seedling*, the *Cynthiana* and the *Herbemont*.

4. VITIS RUPESTRIS *Scheele*—A small bushy plant, often without any tendrils, rarely somewhat climbing; leaves small (2—3 inches wide) mostly broader than long, heart-shaped, scarcely ever slightly lobed, with broad coarse teeth and usually an abruptly elongated point, glabrous, and of a rather light green color; berries middle-sized, on very small bunches; seeds mostly 3—4, obtuse, with a very delicate raphe.

This very peculiar grape-vine is found only west of the Mississippi, from the Missouri river to Texas and westward probably to New Mexico. In our State where it is called *Sand grape*, and in Arkansas, it grows on the gravelly banks and over-flowed bars of mountain streams; in Texas also, on rocky plains, whence the Latin name; it is there also known under the name of *Sugar grape*. Its luscious fruit ripens with us in August.

It is nowhere yet in cultivation but may in future prove of value.

b. Berries large, 7-9 or even 10 lines in diameter; raphe scarcely visible on the more or less deeply notched top of the seed.—These plants on well grown shoots bear a tendril opposite each leaf with only rare and irregular intermissions.

5. VITIS LABRUSCA *Linnæus*—Plants usually not large, climbing over bushes or small trees, though occasionally reaching the tops of the highest trees, with large (4-6 inches wide) and thick, entire or sometimes deeply lobed, very slightly dentate leaves, coated when young with a thick rusty, or sometimes whitish, wool or down, which in the wild plant remains on the lower side but almost disappears in the mature leaf of some cultivated varieties: berries large, in rather small or middle-sized bunches, bearing 2 or 3 or sometimes 4 seeds.

This plant, usually known as the *Fox-grape* or *Northern Fox-grape* is a native of the eastern slope of the continent from New England to South Carolina, where it prefers wet thickets; it extends into the Alleghany mountains and here and there even down their western declivity, but is a stranger to the Mississippi Valley. The most important varieties of this grape-vine now cultivated in our country (such as the *Catawba, Concord, Isabella, Hartford Prolific*, and dozens of others) are the offspring of this species; they are all easily recognized by the characters above given, and more readily by the peculiar arrangement of the tendrils as above described.

II. GRAPE-VINES WITH A FIRMLY ADHERING BARK, WHICH DOES NOT SCALE OFF; TENDRILS ALMOST ALWAYS SIMPLE; BERRIES VERY LARGE (7—10 LINES IN DIAMETER), VERY FEW IN A BUNCH; SEEDS WITH TRANSVERSE WRINKLES OR SHALLOW GROOVES ON BOTH SIDES.

6. VITIS VULPINA *Linnæus*—Bushy or sometimes climbing high, with small (2 or at most 3 inches wide) rounded, heart-shaped, firm and glossy dark green leaves, smooth or rarely slightly hairy on the under side, with coarse, large or shallow teeth.

good authority, and such action may be mutually profitable. Specimens should be sent at flowering time, and should include the whole shoot with full sized and young leaves, blossom, and tendril; and after the fruit is ripe a bunch of the berries and seeds from the same stock should follow.

The proper classification of our different varieties is of more importance in this connection than would at first appear. Since the publication of some of the facts set forth in this article, a few enterprising French grape-growers, in the districts desolated by the louse, have conceived the idea of importing from this country such varieties as are most exempt from the attacks of the *Phylloxera*, and M. LeFranc, the Minister of Agriculture, has likewise expressed his intention of so doing. Already a number of varieties, and especially the Cunningham, Herbemont, Norton's Virginia, Concord, Hartford Prolific, Clinton and Martha have been shipped to M. J. Leenhardt, of Montpellier, France, and others to Switzerland, by Messrs. Isidor Bush and Co. If America has given this plague to England, why should she not in return furnish her with vines which are capable of resisting it? At least nothing but good can come of the trial, for though our grapes are generally sneered at on the other side of the water, we have made such rapid improvements in viticulture during the last ten years that they scarcely know anything of our better kinds; and many of those which do well in Missouri will doubtless succeed in France. Such of our vines as have already been cultivated there are often differently classified by their writers to what they are by American authors, and confusion consequently ensues. Thus, one of my correspondents, M. Laliman, of Bordeaux, who has cultivated a number of them for several years, classes the Clinton and

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This southern species known under the name of *Southern Fox Grape Bullace* or *Bullit-grape* is found along water-courses, not farther north than North Carolina and Arkansas, and may possibly straggle into southeastern Missouri. Some of its cultivated varieties, especially the white *Scuppernong*, are highly esteemed in the South but do not perfect fruit in the latitude of St. Louis.

I recognize only three other species of the true grape-vines in the territories of the United States. The most remarkable of these is the Mustang grape of Texas, *Vitis candicans* Engelm. (*V. Mustangensis* Buckley), with rather large, rounded, almost toothless, rarely deeply-lobed leaves; white woolly on the under side, bearing berries, which in its native country are now beginning to be made into wine; *Vitis Californica* Bentham, the only wild grape of California, has rounded downy leaves, and small berries, and is not made use of as far as is known; *Vitis Arizonica* Engelm., similar to the last, but glabrous, with middle-sized berries, reported to be of a luscious taste. Neither of these shows a prominent raphe on the seed, so that this character is peculiar only to the first 3 species here enumerated.

Taylor as *æstivalis*, and the Norton's Virginia and Delaware as *Labrusca.**

I will now indicate the susceptibility of different varieties to the disease.

Vitis vinefera (European).— All European varieties with roots badly affected. In many instances decomposed and gone, with the vines about dead. No leaf-galls.

V. riparia (River Bank). Clinton — Leaf-galls extremely abundant. Root-lice only moderately so. Taylor—Where leaf-galls are few, root-lice abundant; where galls are abundant fewer root-lice. Delaware — A few leaf-galls; lice abundant on roots. Othello (hybrid with *vinefera*) — Both leaf-galls and root-lice, the latter tolerably numerous. Louisiana (some say a seedling of *vinefera*, others again believe it *æstivalis*) — Leaf-galls and root-lice, but neither bad. Alvey — Few leaf-galls; plenty of root-lice. Cornucopia (hybrid with *vinifera*)— No leaf-galls ; roots badly affected with lice. Wild vine — Numerous leaf-galls and a few root-lice; much in same condition as Clinton.

V. æstivalis (Summer). Cunningham — No leaf-galls, but a few root-lice. Cynthiana—Occasionally a few galls; lice abundant on roots. The vine has a vigorous growth and the roots are large and strong. Herbemont — A few leaf-galls, and scarcely any root-lice. Norton's Virginia — No leaf-galls, but some root-lice.

V. Labrusca (Northern Fox). Isabella, or seedlings of Isabella—No leaf-galls; a few root-lice: roots strong and vines flourishing. Martha—No leaf-galls; very few root-lice. Hartford—No leaf-galls; very few root-lice. Ives—No leaf-galls; lice tolerably abundant on roots. North Carolina—No leaf-galls; very few root-lice. Maxatawney—No leaf-galls; root-lice quite abundant. Creveling—A few leaf-galls; root-lice abundant. Catawba —No leaf-galls; root-lice very numerous, abounding even on the larger roots as on the European vines. Gœthe (hybrid with *vinifera*)—No leaf-galls but lice on roots very numerous. In the vineyards of Messrs. Isidor Bush & Sons, of Bushburg, Mo., this vine was very vigorous and thrifty in 1869 and 1870, but has done poorly the present year. Dracut Amber—No leaf-galls; few root-lice. Wilder (hybrid with *vinifera*—No leaf-galls; not many root-lice. Challenge (hybrid with *vinifera*)—No leaf-galls, roots affected but moderately. Diana—No leaf-galls, but plenty of root-lice.

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* Etude sur les divers Phylloxera, et leur médications.

V. vulpina (Southern Fox or Muscadine)—As it is not grown in this locality, being considered absolutely worthless here, I know little about it.

From this experience it would appear that no vines of those named, are entirely free from the attacks of the root-louse; but that the European varieties are most susceptible to it; the Northern Fox, next in order, the River Bank grape next, and the Summer grape being the least affected. It would likewise appear that galls are occasionally found on all of the species except the European, and as they have, in a few instances, been found on this species in Europe, it cannot be considered entirely exempt.* Nevertheless, in general terms, the River Bank grape must be considered the species which the gall-louse prefers. Experience on this point will, no doubt, vary in different parts of the country, and more extended experience may modify some of these deductions.

We thus see that no vine, whether native or foreign, is exempt from the attacks of the root-louse. Yet, on the principle that a small dose of poison may prove harmless or even beneficial where an over-dose will kill, we find that a small number of root-lice produce no serious effects upon a vine; and that it is only where they are very numerous, and cause not only the fibrous roots but even the larger ones to waste away, that their evil effects are perceptible. With most of our native vines when the conditions are normal, the disease seems to remain in the former mild state, and it is only with the foreign kinds, and with a few of the natives under certain conditions, that it takes on the more acute form.

In France, according to M. Laliman, the American varieties which have resisted the root-louse best are the Clinton, Taylor, Herbemont (known there as Warren), and some others which are considered valueless here, such as the Pauline, Elsimboro, Lenoir Mustang of Texas, and a kind of York-Madeira; while those which succumb are the Isabella, Scuppernong, Concord, Norton's Virginia, Maxatawney, Hartford Prolific, Cynthia, etc. This experience differs a little from ours, but shows that the Labruscas suffer most there also. — *To be continued.*

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*Since this was written I have been informed by Mr. Glover of the Department of Agriculture, that the leaves of certain European vines, in green-house, such as *Muscat Hamburg* and *Madam Pince*, were crowded with the galls, even as late as December; and they had begun to spread on to the *Sonora* and the *Duc de Malacoff*.